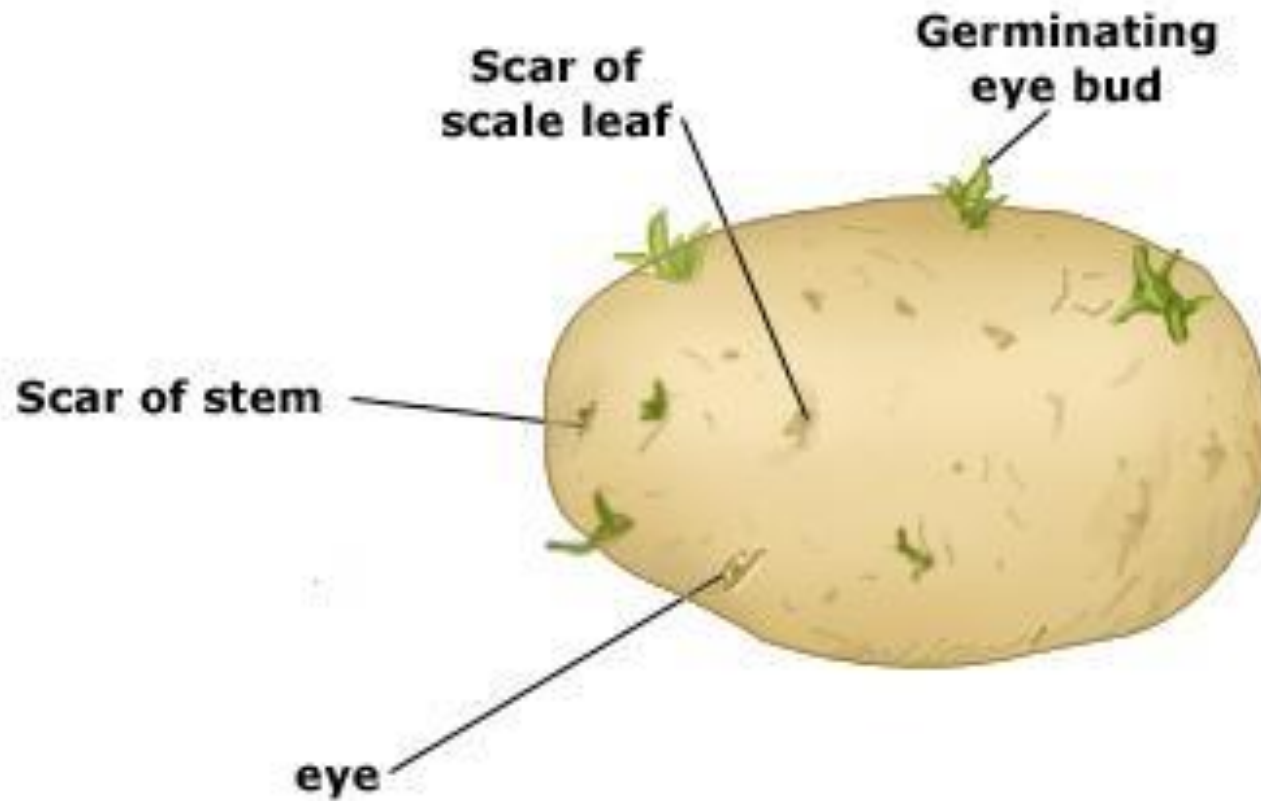


Stems



Functions:

- Supports and raises leaves, flowers and fruits
- Vascular bundles (long strand of xylem and phloem) transports water and dissolved minerals between root and leaves
- Space out the leaves to maximize the amount of light and air they get
- Sometimes for photosynthesis
 - Sometimes stores food (cactus, potato)

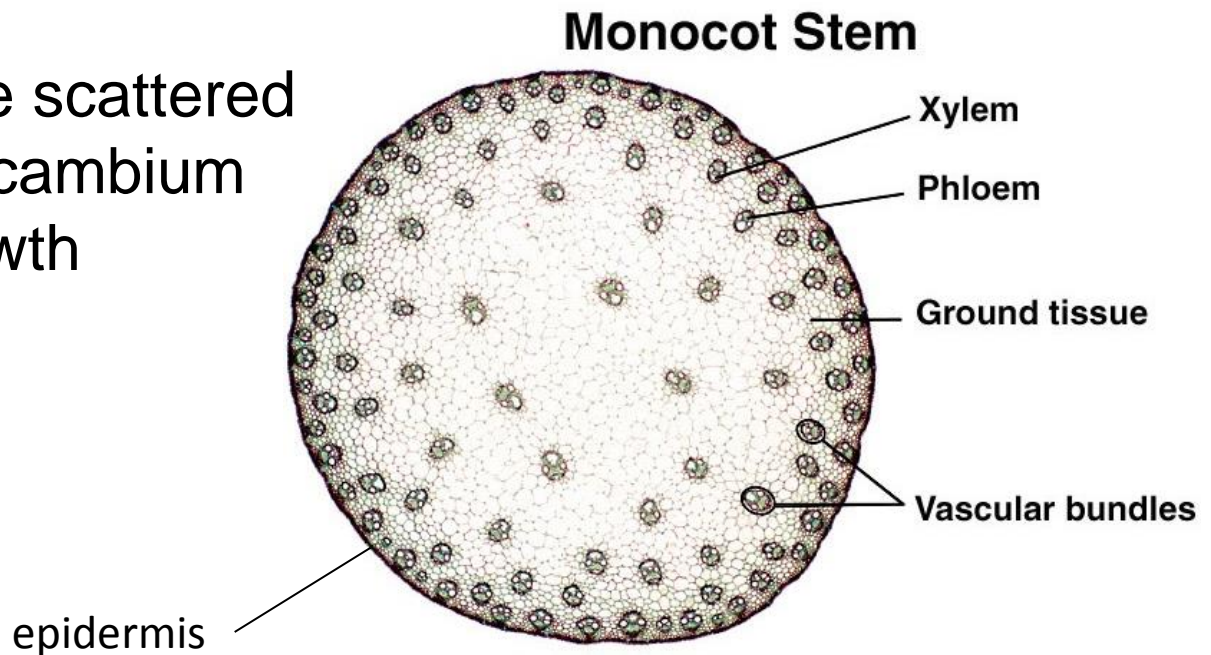


Inner Tissue of Stems

1. Herbaceous (Hur-Bey-shuh-s) stems live for 1 year and do not contain woody tissue. Usually green and flexible. Do not grow more than 1 metre tall (exception – palm trees (not trees))

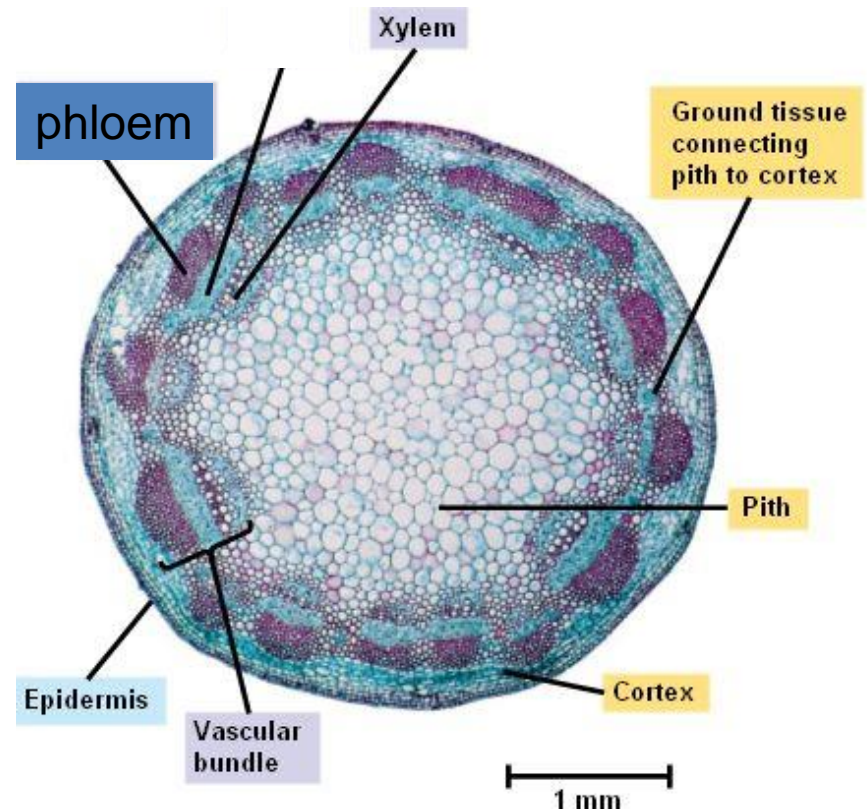
a. Monocot

- vascular bundles are scattered
- usually no vascular cambium so no secondary growth



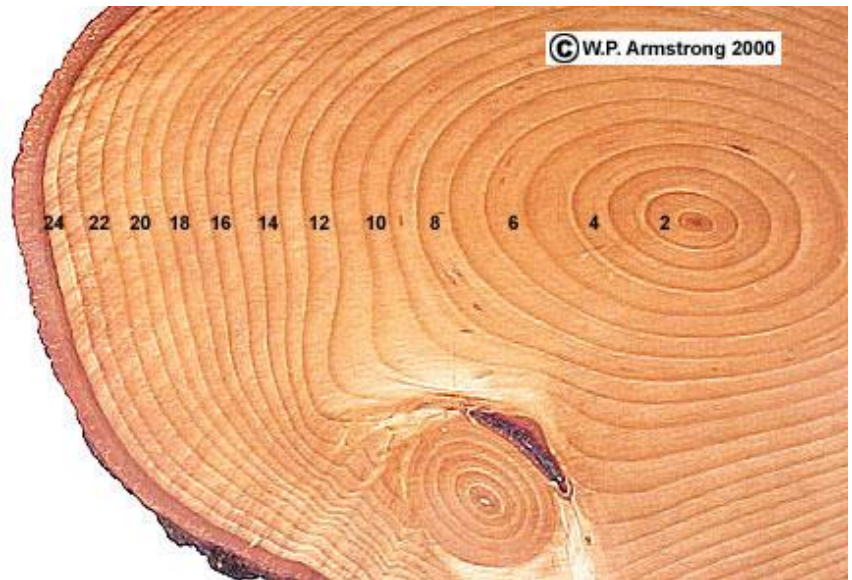
b. Eudicot

- Vascular bundles arranged in a ring
- Large outer cortex region and inner pith region
- Has **vascular cambium** (meristematic tissue) between xylem and phloem
- Remember increase in the width (growth), is produced by meristematic tissue between the primary xylem and phloem called vascular cambium

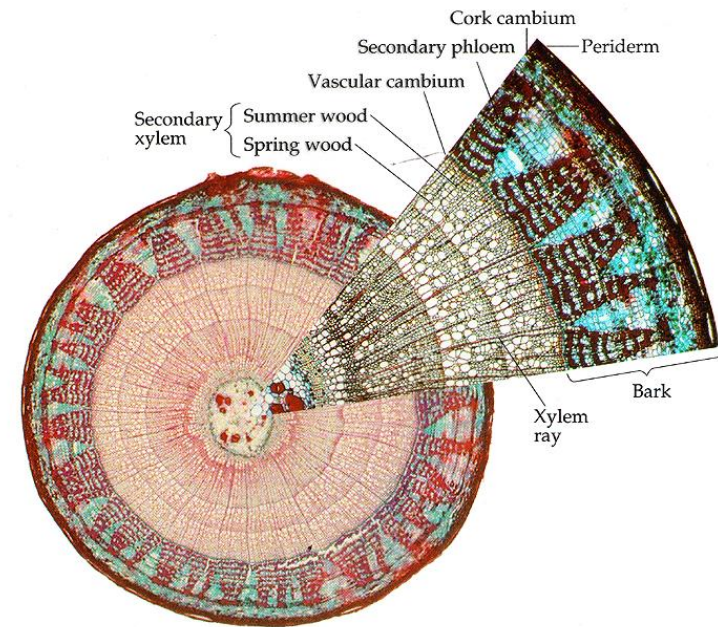


2. **Woody stems** live for more than 1 year with roots and stems increasing in diameter each growing season.

- annual rings are actually layers of xylem, they are counted using core sampling to determine the age of the tree.



- In spring, the vascular cambium grows rapidly, producing large xylem cells (Spring wood – thin walled)
- In summer, fewer, smaller, darker xylem cells are produced (summer wood – thick walled).
- the inner tissue is dead xylem, the outer tissue is phloem and vascular cambium. Old phloem forms the inner bark.
- Older xylem layers form the heartwood (very rigid – supports the tree)

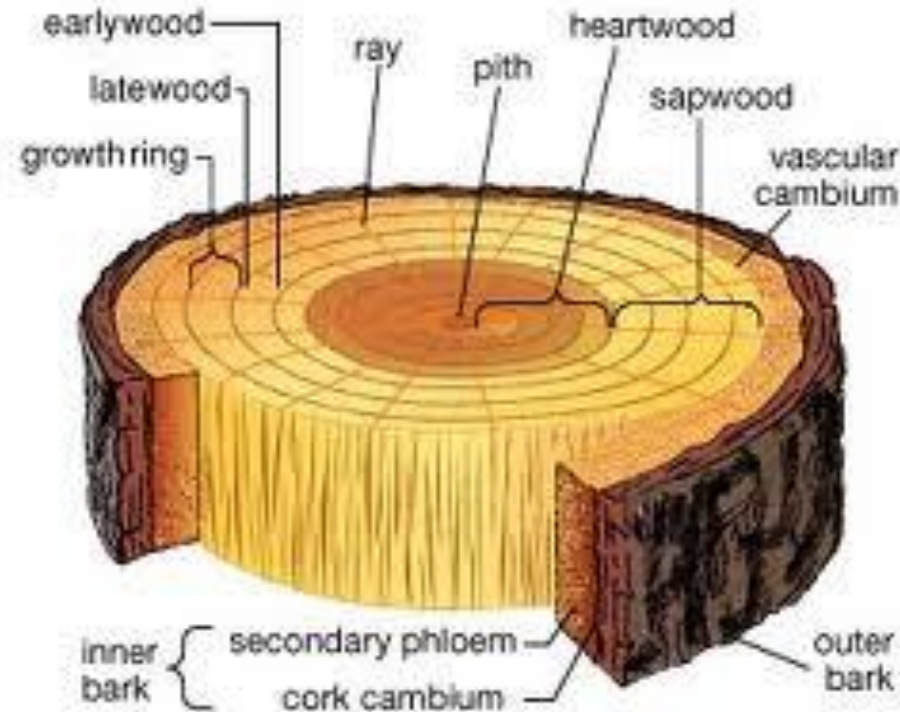


Bark:

- phloem, cork cambium and cork

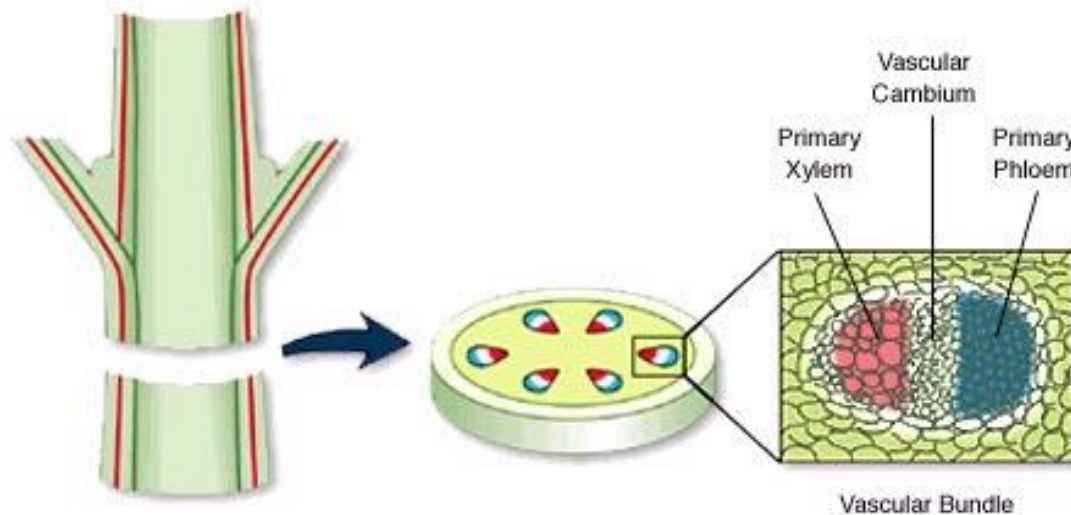
Cork Cambium:

- A thin layer of meristematic tissue that produces **cork** (a tough waterproof outer layer, continually being replaced as tree grows)

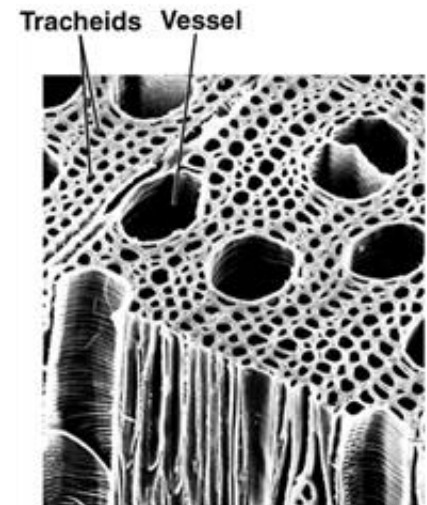
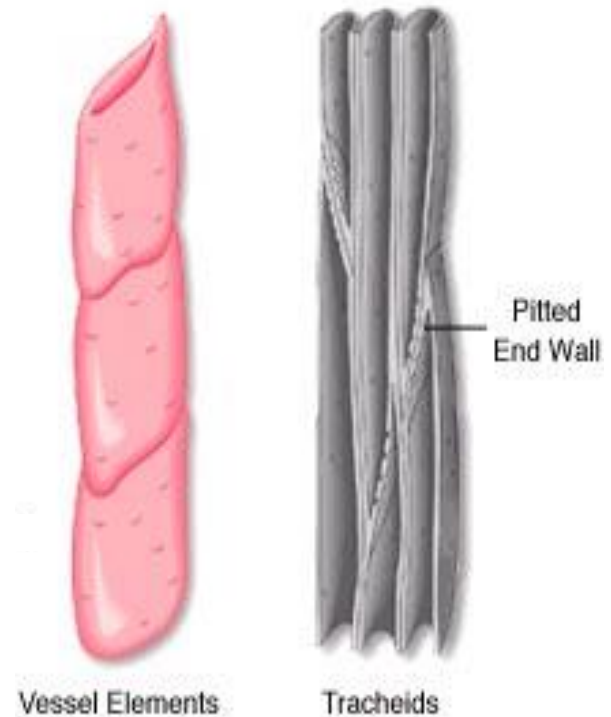


Vascular Tissue

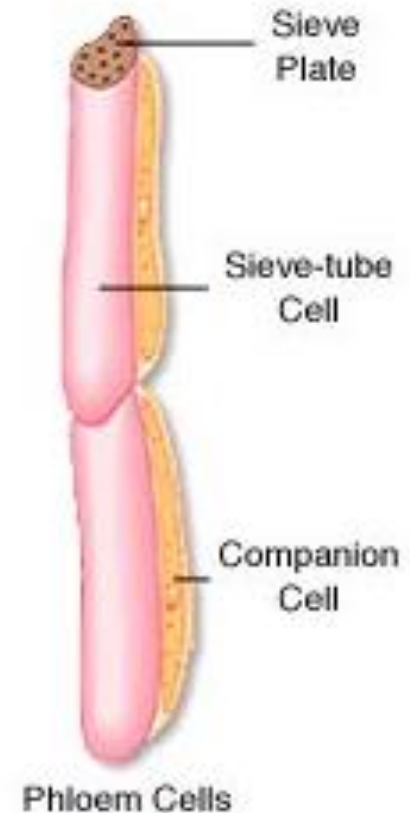
In vascular bundles the xylem is always closest to the centre of the stem.



1. **Xylem**: dead at maturity, transports water upward from the roots.
 - Composed of (1) tracheids and (2) vessel elements, both are dead at maturity.
 - Tracheids have tapered ends connected by pits (transport between xylem) in their walls. Overlap one another to form continuous tubes from root to shoot.
 - Vessel elements are shorter and wider forming continuous tubes called vessels. Stacked end to end to form vessel tubes that run from root to shoot



2. **Phloem**: living cells, transports dissolved sugars (food), hormones, and ions.
- Composed of living sieve cells (gymnosperms) that conduct (transport) material
 - sieve tube elements (angiosperms) have few organelles, have sieve plates and transport sugar, companion cells next to sieve tube elements have organelles to support the sieve tube elements.
 - Conducting cells are connected by clusters of pores called sieve plates.



Types of Stems

- Stolons or runners – above-ground horizontal stems (ex. Strawberries)
- Rhizomes – underground horizontal stems (ex. Iris)
- Tubers – enlarge rhizomes (ex. Potatoes)
- Corms – bulbous underground (ex. gladiolus plant)

